Some Estimates of the Value of the Harvest of Chum Salmon from Fish Creek, near Hyder, Alaska

by

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BACKGROUND

One of the most unique chum salmon-producing streams on the North American continent is in trouble. For the second year in a row, Fish Creek, a tributary of Salmon River, which is in southern southeastern Alaska at the head of Portland Canal, has been scoured and laden with silt from the overflowing Salmon River. Eggs deposited by the 1972 brood year spawners were mostly scoured out. Moreover, the flood this year (in September) was more severe than the one last year, and if this situation is not corrected by next fall, an irreplaceable resource could be lost.

Although Fish Creek is a relatively small stream, it is unique because it produces what are probably the largest chum salmon in North America. Several specimens weighing more than 38 pounds have been measured by biologists from the Auke Bay Fisheries Laboratory, and fish weighing 25 pounds are common. The average weight of chums throughout their range is close to 10 pounds, whereas the average for Fish Creek chums is close to 20 pounds. Length measurements taken in 1972 and 1973 by J. Helle at Fish Creek also confirm the large size of these fish. The average size (and maximum size) of Fish Creek chum salmon exceeds by far the average or maximum size of any chum salmon stock in the world that we know of.

The extreme flooding in Fish Creek started in the early 1960's when the water of Summit Lake, British Columbia, "blew" a hole through the glacier that forms one end of the lake. As the glacier receded and the water pressure built up, the lake emptied down Salmon River instead of on the other side of the summit--a situation that has occurred almost yearly since the first occurrence. The tremendous volumes of water (up to 150,000 cfs) caused large deposits of gravel and boulders to build up and to shift the channel. The channel that has broken through now spills over the road and into Fish Creek during high water. In September 1973, 3,000 feet of road was washed out, and some of the best spawning areas in Fish Creek were badly scoured. In September 1972, the same thing happened. It is possible that most of the salmon spawn was scoured out in both years. In addition, Salmon River water is silt laden and much silt was undoubtedly deposited in Fish Creek. A dike was built by the Alaska Department of Highways and the Granduc Mining Company (a Canadian firm that is the prime user of the road) after the 1972 flood, but the dike wasn't extensive enough to hold the water.

A dike that would protect the road could also protect Fish Creek; therefore, several State and Federal agencies and a private company are interested in a common solution. National Marine Fisheries Service is interested in the research aspects of this unique genetic stock. U.S. Forest Service has dual interests--large volumes of timber are being washed away and the fish habitat is being destroyed. Alaska Department of Fish and Game has an economic interest in the value of the fish

produced to the commercial fishery and to a somewhat lesser degree to the sports fishery (Fish Creek also produces good populations of Dolly Varden trout and coho salmon). Finally, the State Department of Highways and Granduc Company both have an interest in reducing maintenance costs of the road.

From the standpoint of saving the chum salmon resource, it is very important to get the work done before the 1974 spawning season, or another brood year of chum salmon may be lost. Information from Mr. Lawrence Marx of Hyder suggests that the spawn from escapements of chum salmon to Fish Creek during 1970 and 1971 as well as 1972 and 1973 may have suffered severe mortalities due to scouring. Data collected by personnel from the Auke Bay Fisheries Laboratory in 1959, 1972, and 1973 indicate that Fish Creek chums are predominately 4 years old (although no intraseasonal age information had been collected). The run returning in 1974 may be reduced in size because of the 1970 flood and every effort should be made to provide a stable spawning environment for these valuable fish.

ESCAPEMENT OF CHUM SALMON TO FISH CREEK

Because of the remoteness of Fish Creek from major population centers in southeastern Alaska, it tends to get neglected. This is true not only from a management standpoint but also from a protection one. Weather, as well as remoteness, makes aerial surveys costly to accomplish; consequently, at best Fish Creek has been visited once a year and in some years no surveys were made. These single surveys also may not have been made when maximum numbers of spawners were in the stream. Therefore, any estimates of total escapement during a season would be minimal at best. Also, because only one survey was made in any one season the only method available for converting these single counts to total escapements is the one commonly used by managers where the peak count times 2.5 estimates total escapement. The accuracy of this method leaves much to be desired but it certainly does give "ballpark" figures. Because of the minimal nature of the yearly "peak" counts, this method probably provides quite conservative estimates of actual escapements at Fish Creek (Table 1).

Fish Creek and Tombstone River are the major systems producing chum salmon in Portland Canal. Tombstone River chum salmon are reputed to be large but we have no evidence to substantiate this claim. In Table 1 we have calculated escapements for Tombstone River in the same manner for years when data was available for both systems. From these data it would appear that Fish Creek receives about 44% of the escapement to upper Portland Canal. It should be kept in mind that because Fish Creek is at the head of Portland Canal the fish returning are subjected to the fishery (Canadian and United States) for a longer period of time than those fish from any other system in Portland Canal.

CONTRIBUTION TO THE COMMERCIAL FISHERY

Chum salmon produced in Fish Creek are very likely captured in several fisheries. Certainly they are caught in other Portland Canal gill net fisheries but also some are probably captured in the Canadian fisheries, and other gill net and seine fisheries in southern southeastern Alaska. There have been no studies designed to sort out the contribution of Fish Creek or Tombstone River chum salmon to the various fisheries. The only way to arrive at any meaningful estimates would be to make some calculations based on the escapements.

If we assume that the fishery takes 60% of the total run (which is probably a minimal figure again) and assume a return per spawner ratio of 2:1 or 4:1 we can make some estimates of the total number of fish contributed to the fishery (Table 2).

Spawner/return ratios of less than 2:1 do occur of course, but ratios higher than 4:1 occur commonly. Therefore, using these two ratios probably results in estimates that are again conservative.

The 1973 average price of $0.625 per pound was used to arrive at a value for the commercial harvest. Even though the Japanese market is presently saturated, in light of the salmon predictions made for next year, knowledgeable people in the market are predicting prices to perhaps even increase 10% or at least stay the same. Regardless, it is an easy matter to adjust the harvest figures to any price for comparisons. For example, at $0.40 per pound the mean value at the 2:1 spawner/return ratio would be $208,800.

We used 15 pounds as the average weight of a Fish Creek chum. This, we know is conservative because some data taken from the gill net fishery in Portland Canal in the early 1960's indicate that 3-year old chums in this area will average nearly 15 pounds. Four- and five-year olds are of course much larger.

Without belaboring the statistics further it seems that the harvest could be worth on the average around 1/2 million dollars annually. There are of course many other values to the State from this unique resource besides the value of the harvest; but, the value of the harvest alone justifies our concerted efforts to perpetuate this resource.

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Table 1. Comparative escapement estimates of chum salmon in Fish Creek and Tombstone River

	Total Escapement (2.5 times peak count)	
Year	Tombstone River	Fish Creek
1973	12,500	8,000
1972	12,500	18,250
1971	3,000	9,000
1970	15,000	3,750
1968	20,000	67,500
1963	149,500	11,500
1962	102,500	750
1957	4,500	95,000
1956	17,500	50,000
mean	37,000	29,000

Table 2. -- Estimates of the number and value of chum salmon contributed to the commercial fishery that were produced in Fish Creek during the lowest and highest recorded escapements and an eight year mean.

Brood year	Escapement	Return in year	Estimated harvest at 60% assuming return per spawner ratio of: 2:1	4:1
1957	95,000	1961	114,000	228,000
(Value*)			(1,068,750)	(2,137,500)
1962	750	1966	900	1,800
(Value)			(8,437)	(16,875)
Mean (8 year)	29,000		(34.800)	(69,600)
(Value)			(326,250)	(652,500)

*Based on 1973 average price of $0.625 per pound and average weight of 15 pounds.

ADDENDUM

A dike was built during May-June 1974 to protect Fish Creek and the road from the flooding Salmon River. The dike was built under the auspices of the Alaska Department of Highways, the U.S. Forest Service, and the Granduc Mining Company and with support from the Alaska Department of Fish and Game, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service.

Summit Lake drained during the middle of the second week in September, and the flood waters coming down the Salmon River crested during the weekend of the 15th. The dike was damaged slightly by the flood waters at the upper and lower ends, but Fish Creek was protected completely. Summit Lake was not full when it drained, so the flood this year was less severe than those that occurred in 1970-73.

We were very fortunate in having a smaller flood to contend with because the weak points in the dike became obvious and those areas received only minor damage. We took aerial photos of the dike system on October 5. Engineers from the Department of Highways and the Forest Service will use these photos to plan for permanent repairs to be made in the dike during June 1975.

Construction of the dike made a considerable improvement in a portion of the spawning area of Fish Creek. Several years ago a channel had been created by the floods that drained silty Salmon River water continuously into Fish Creek starting just below the bridge. The dike sealed off this channel, and the area below the bridge now receives only Fish Creek water.

We had some concern that the dike could have changed the pattern of upwelling ground water into the Fish Creek streambed (which is one of the major factors that makes Fish Creek an outstanding chum salmon system). We verified that upwelling ground water is still detectable throughout the major spawning sections above and below the bridge by measuring differences in temperature in the intragravel and stream water.

Fish Creek received an outstanding escapement this season, and had it not been for the dike, a large part of the spawn would likely have been lost because of scouring of the streambed. We visited Fish Creek on August 23, before the flood, and again on October 5, nearly a month after the flood. We sampled over 200 chum salmon each trip for size and age studies. The entire stream was inventoried for live and dead fish on both trips also. These counts are listed in Table 1. Personnel from the Alaska Department of Fish and Game also made foot-survey counts at Fish Creek this season and their counts are listed also in this table.

We estimated the total number of spawners for the season to be 33,229. The estimates were determined from repetitive foot surveys by a technique evaluated at our Olsen Bay Field Station (see pages 5-12, Special Special Scientific Report--Fisheries No. 602, by John H. Helle). The procedures for applying this technique are outlined in Table 2. We have used 8 days as an estimate for the average stream life. This figure is based on studies in Prince William Sound because no such studies have been done on the Fish Creek chum salmon.

Table 1.--Counts of live and dead chum salmon in Fish Creek during 1974 made by foot surveys

Date	Agency*	Live chum	Dead chum
August 23	USFS and NMFS	4,990	2,350
August 29	ADF&G	8,060	5,650
September 16	ADF&G	1,070	(?)
October 5	USFS and NMFS	3,657	1,390

* USFS = U.S. Forest Service

NMFS = National Marine Fisheries Service

ADF&G = Alaska Department of Fish and Game

Table 2.--Calculation of total escapement of chum salmon in Fish Creek, 1974

Date	No. of days	No. of fish	No. of fish days
August 23	16	4,990	79,840.0
August 29	12	8,060	96,720.0
September 16	18-1/2	1,070	19,795.0
October 5	19	3,657	69,483.0
Total			265,838.0

$$\text{(Total no. fish days)} \quad \frac{265,838}{8}$$
$$\text{(Estimated stream life)}$$

Total estimated escapement = 33,229

Past records of the escapements of chum salmon in Fish Creek indicated that peak numbers were in the stream in mid-August. Surveys were probably never made in September or October before. As indicated by the counts in Table 1, this run continued well into October. We were informed by Lawrence Marx of Hyder that the run ended during the week of October 21-27. Observations made by Richard Wilson (USFS) in 1973 indicated that the run extended well into October that season also.

If the runs in 1961-72 extended into October, there could have been a strong selection for smaller chum salmon occurring in those years. The floods usually occurred during the period from late August to early October. If a substantial portion of the early spawn was scoured out, survival would have favored the progeny of later spawners. In most chum salmon streams the late-spawning fish in the system are smaller and younger.

In summary, the first test of the Fish Creek dike this season was highly successful. Not only did the dike protect the spawning grounds of a very good escapement of chum salmon, but it also resulted in an improvement of the streambed quality of a large section of Fish Creek. This improvement should result in higher freshwater survival of the young chum salmon.

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